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Durchenwald

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[54] **RESPECTIVE INFLATABLE ARBORS FOR MAKING BACKDRAFT CAVITY IN SAND CORE AND FOR FORMING PART OF CORE LIFT DEVICE INSERTABLE IN CAVITY**

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[51] **Int. Cl.**[7] **B22C 9/10**; B22C 23/00

[52] **U.S. Cl.** **164/170**; 164/171; 164/186; 164/412; 249/179; 269/22; 269/48.1; 294/98.1

[58] **Field of Search** 164/412, 401, 164/170, 171, 186, 213, 228; 249/65, 178, 179; 269/22, 48.1; 294/98.1

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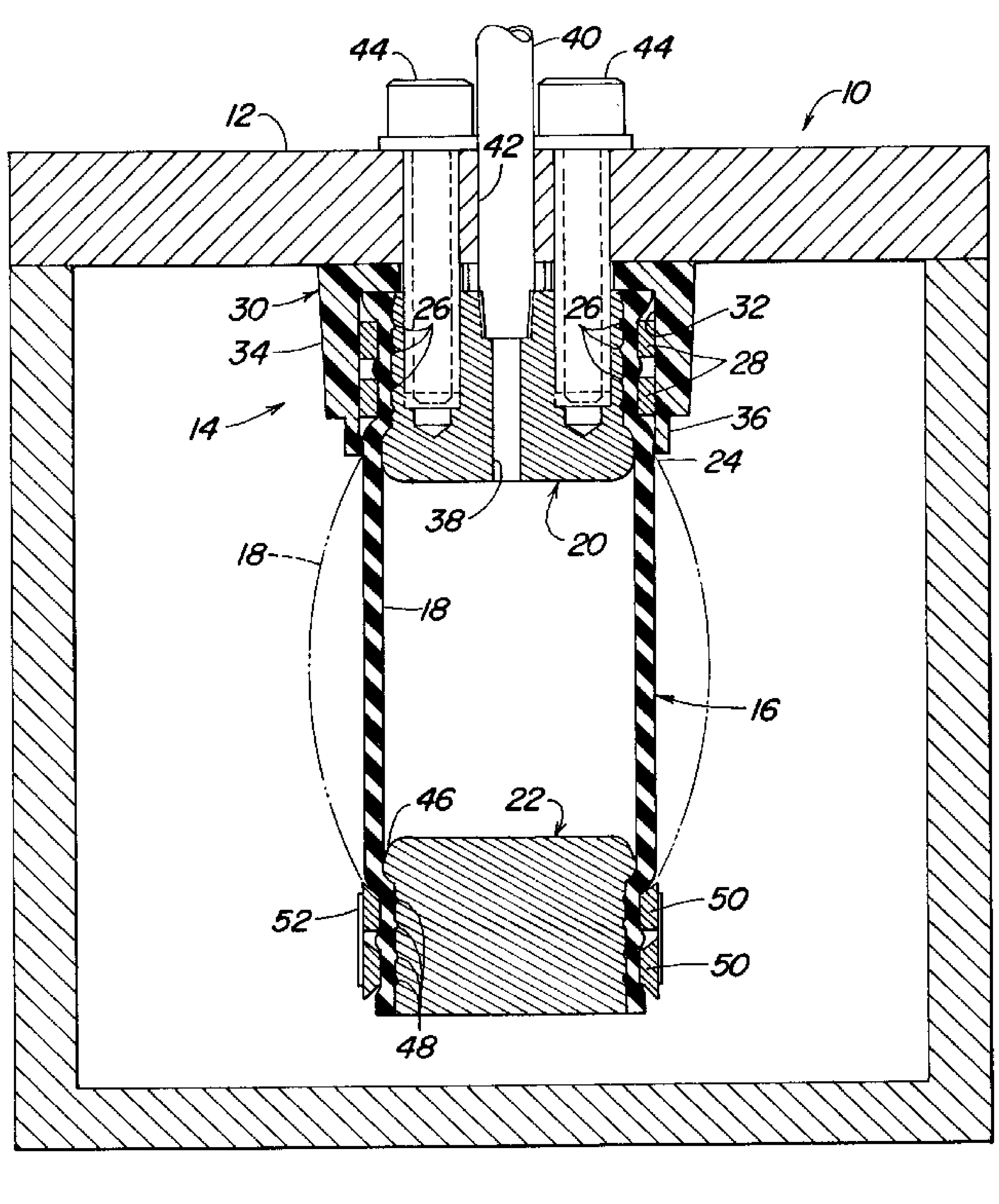
Primary Examiner—J. Reed Batten, Jr.

[57] **ABSTRACT**

Tooling includes an inflatable arbor for forming a backdraft cavity in a foundry sand core. A core handling device includes an inflatable arbor, similar to the one used for forming the backdraft cavity in the sand core, whereby the lifting device arbor, when in its deflated state, may be inserted into the backdraft cavity of the sand core and then inflated to grip and become locked to the sand core.

4 Claims, 4 Drawing Sheets



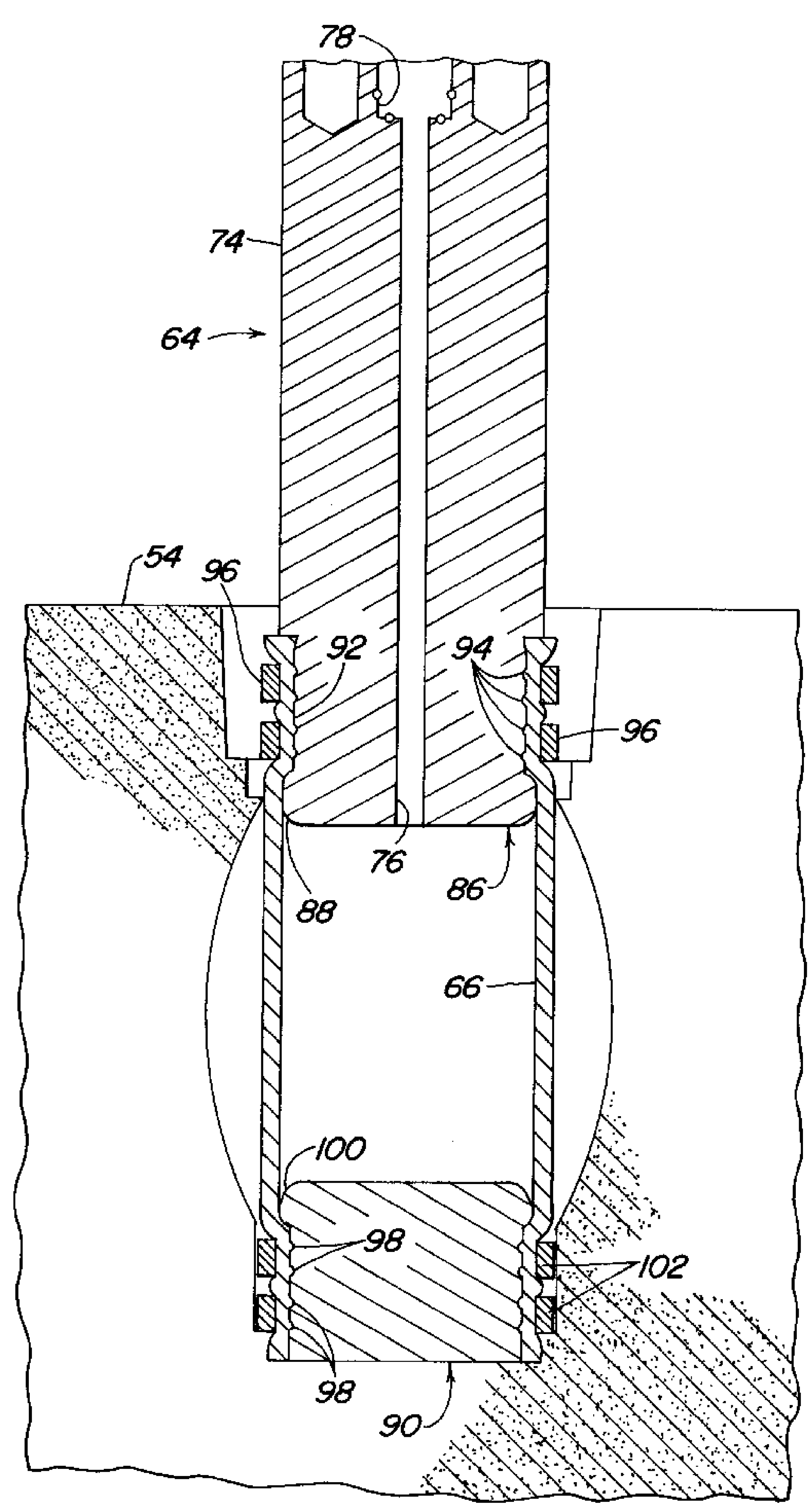
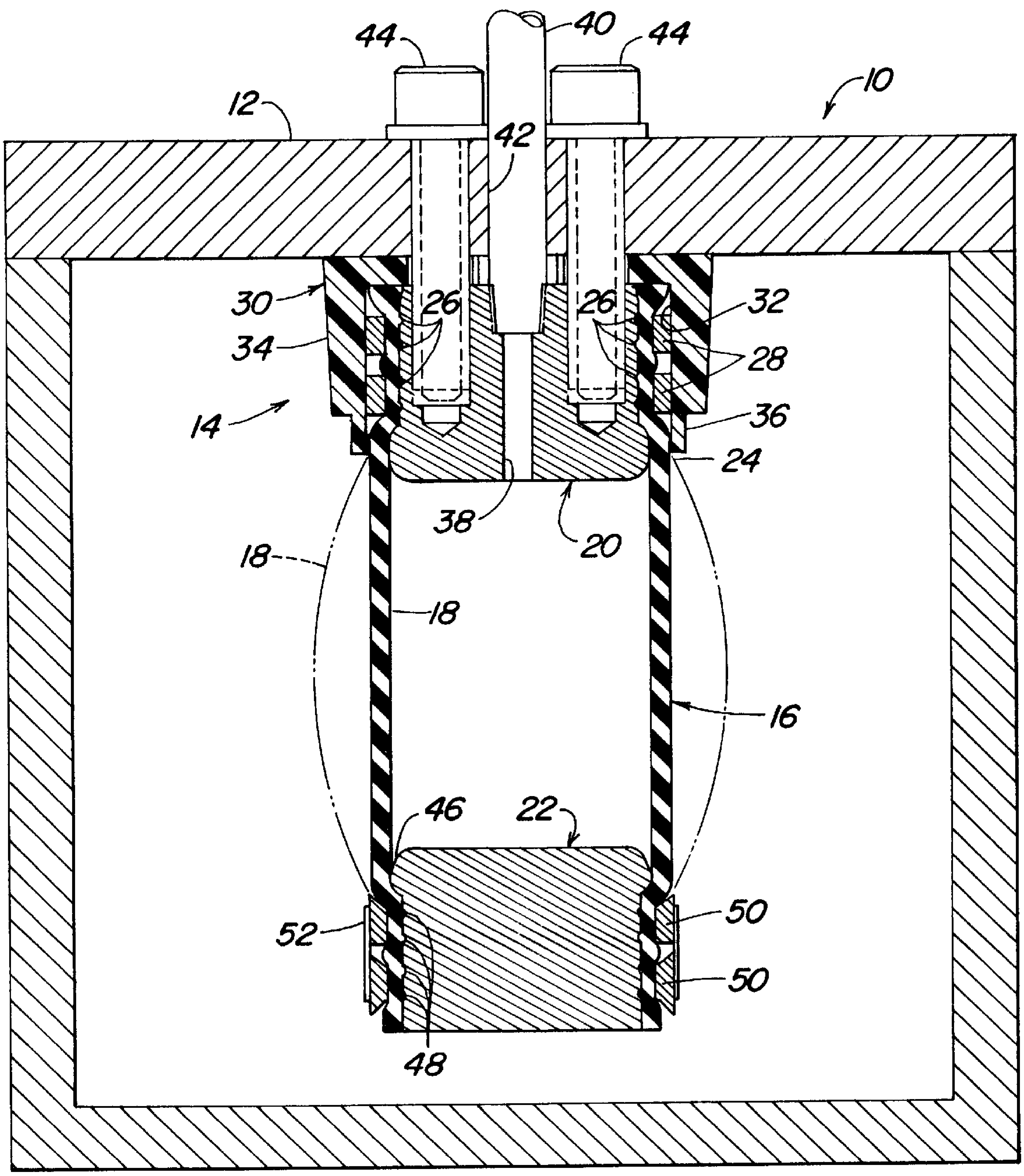


FIG. 1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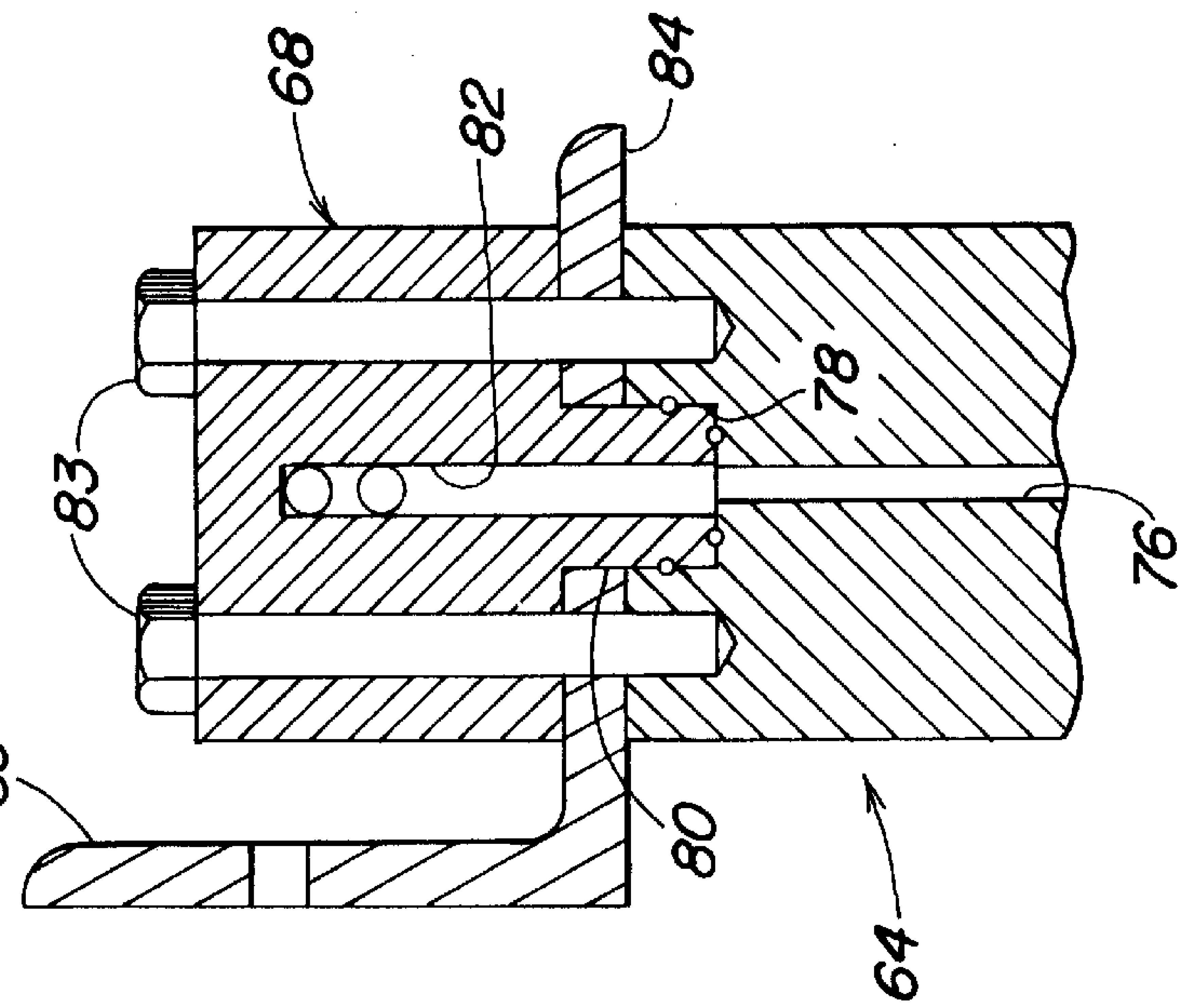


FIG. 5

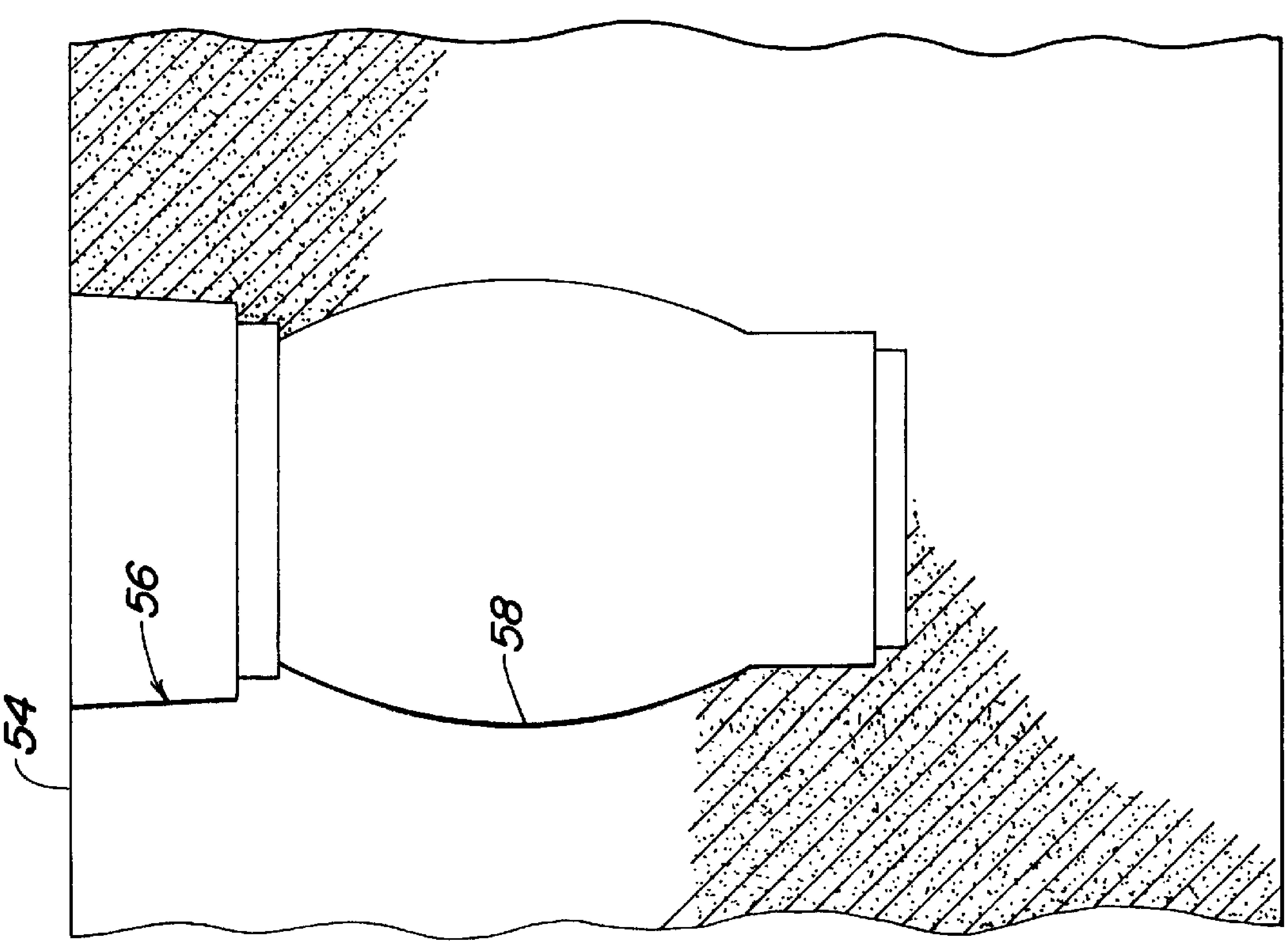
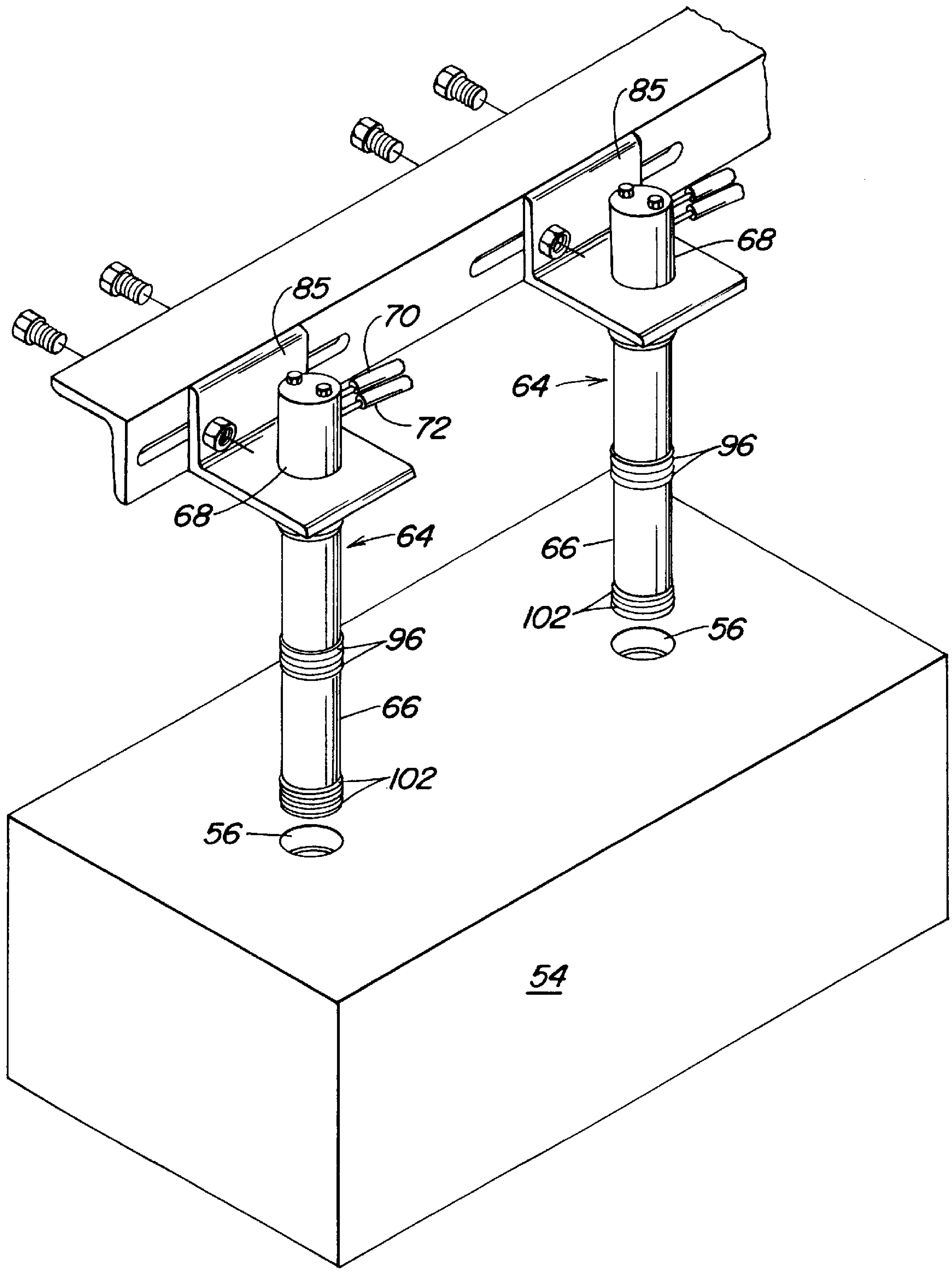


FIG. 2

FIG. 3



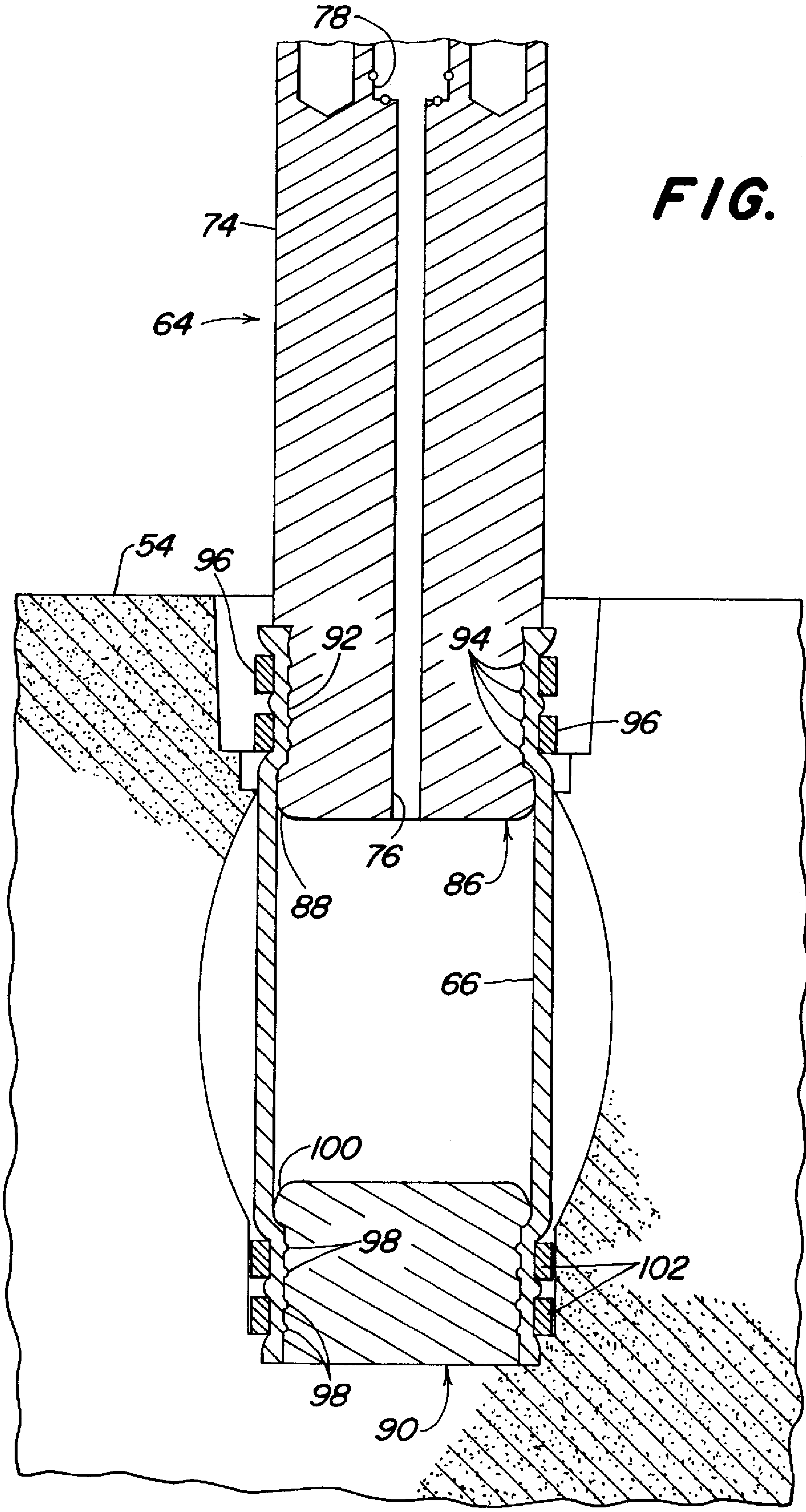


FIG. 4

RESPECTIVE INFLATABLE ARBORS FOR MAKING BACKDRAFT CAVITY IN SAND CORE AND FOR FORMING PART OF CORE LIFT DEVICE INSERTABLE IN CAVITY

BACKGROUND OF THE INVENTION

The present invention relates to a system for handling foundry sand cores and more specifically relates to such systems which include tooling for forming cavities or receptacles in sand cores, and lifting devices including inflatable arbors for being inserted in and expanded against the wall of the cavity previously formed in the sand core.

In order to improve the finish on casting surfaces, foundry sand cores are often coated or washed with a refractory slurry which is then dried onto the core surface. One way of applying the wash to the core is by dipping the core in a vat containing the slurry. Movement of these cores to and from the vat and into position for entering a drying oven is often accomplished by lifting devices or hoists having at least one arbor insertable into a hole formed in the sand core by a tapered pin located in the corebox when the loose core material is being blown into the corebox. The arbor is of a type including an expandable urethane cylinder which is selectively inflated to swell out against the walls of the hole. Thus, friction is the means for retaining the core on the arbor. Pull tests have shown this method of retention to be variable in effectiveness. For example, the capacity for holding the core on the arbor is diminished when the surface of the wall of the hole is wet, as is often the case when a core wash has been applied to the surface of the core.

U.S. Pat. No. 4,915,157 granted to Durchenwald on Apr. 10, 1990 discloses a core handling device equipped with one or more arbors constructed with an expandable urethane cylinder, as described.

SUMMARY OF THE INVENTION

According to the present invention there is provided an improved foundry sand core handling system of the type including tooling, used with the corebox for forming one or more cavities or receptacles in the core, and a lift device incorporating one or more expandable arbors, each insertable into a respective void or receptacle provided in the core.

An object of the invention is to provide a sand core handling system including selectively expandable tooling for use with a corebox for forming one or more cavities having backdraft in a sand core and to provide a lift hoist having one or more arbors, constructed in a manner similar to such tooling, for being inserted in said cavities and expanded to grip the core for handling.

Yet a more specific object of the invention is to provide a sand core handling system, as described in the previous object, wherein the corebox tooling and lift device each include one or more arbors, with each arbor being constructed to include a cylindrical bladder which is inflatable to a barrel shape, the tooling being positioned in a corebox and the arbor inflated prior to core sand being blown, or otherwise introduced, into the corebox and then deflated to permit it to be withdrawn from the core so as to leave a barrel-shaped cavity, i.e., a cavity having backdraft, for receiving the inflatable cylinder of the lift device arbor.

These and other objects will be apparent from a reading of the ensuing description together with the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a vertical sectional view showing backdraft tooling including an arbor having an inflatable cylinder

positioned in a foundry corebox prior to being inflated and prior to core sand being blown, or otherwise placed, into the corebox.

FIG. **2** is a vertical sectional view through a backdraft cavity formed in the core by the tooling shown in FIG. **1**.

FIG. **3** is a perspective view of a core containing two backdraft cavities and a lifting tool having a pair of arbors having inflatable cylinders positioned for entering the cavities.

FIG. **4** is a vertical sectional view showing the inflatable cylinder of a lift device arbor positioned in the backdraft cavity created by the inflatable cylinder of the arbor of the backdraft tooling shown in FIG. **1**.

FIG. **5** is a vertical sectional view showing the upper portion of one of the lifting tool arbors illustrated in FIG. **3** and its connection with the bracket supporting the arbor.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. **1**, there is shown a corebox **10** having a top wall **12** supporting backdraft tooling **14**. The tooling **14** includes an arbor comprising an inflatable cylinder **16** formed from a resilient, expandable cylindrical tube or sleeve **18** constructed of urethane or reinforced woven rubber material, for example. Top and bottom cylindrical plugs **20** and **22**, respectively, are received in upper and lower end portions of the tube **18**. The top plug **20** has an upper end disposed flush with an upper end of the tube **18** and has an enlarged lower end portion **24** having a diameter substantially equal to an inner diameter of the tube. Spaced along the exterior of the top plug **20** from its upper end to the lower end portion **24** are a plurality of annular grooves **26**. Encircling an upper length of the tube **18** located above the plug end portion **24** is a pair of crimp rings or bands **28** tightened so as to compress the tube such that it fills the annular grooves **26** to make a tight seal. A cap **30**, made of ultra high molecular weight plastic, forms a top of the cylinder **16**. The cap **30** includes a cylindrical inner wall **32** engaged with the crimp rings or bands **28** and includes an outer wall including a major conical upper section **34**, which tapers slightly downwardly and inwardly, and an inwardly stepped lower cylindrical section **36** which extends from a point even with a bottom of the lower crimp band **28** to a point approximately even with a mid-length location of the plug end portion **24**. The tapered upper section **34** of the outer wall permits easy withdrawal of the tooling from the sand core. An axial bore **38** is provided in the top plug **20** to provide an inlet to the cylinder **16**. An upper end of the bore **38** is threaded and a pressure fluid supply conduit **40** has a lower threaded end coupled to the bore **38**. A hole **42** is provided in the top wall **12** of the corebox **10**, with the conduit **40** extending through the hole. The upper end of the cylinder **16** is secured to the upper wall **12** by a pair of stud bolts **44** extending through wall and having lower ends threaded into threaded blind bores provided in the top of the plug **20**.

The bottom plug **22** is located within the lower end portion of the sleeve **18** with its lower surface being flush with the lower end of the plug **22**. Like the lower end portion **24** of the upper plug **20**, the lower plug **22** has an upper enlarged end portion **46** having a diameter substantially equal to the inner diameter of the sleeve **18**. A plurality of annular grooves **48** are located along the plug **22** below the end portion **46**. A pair of flanged crimp rings or bands **50** encircle the sleeve **18** in a zone below the end portion **46** of the plug **22** and are tightened so as to compress the sleeve

18 into the grooves **48** so as to form a fluid tight seal. The joint between the bands **50** are taped, as at **52**, so as to prevent sand from entering between the bands and to present a smooth surface for easy withdrawal from the sand core.

Thus, it will be appreciated that before sand is introduced into the corebox **10**, the cylinder **16** is inflated to the dashed line positioned shown by routing pressure fluid to the cylinder **16** by way of the conduit **40**. Referring now to FIG. **2**, there is shown a sand core **54** containing a cavity **56** which is formed by ramming core sand into the corebox **10** while the cylinder **16** is inflated and then withdrawing the tooling **14** from the corebox. The cavity **56** reflects the shape of the cylinder cap **30** and inflated sleeve **18** and, as such, includes a barrel-shaped section **58** having an upper half which forms a backdraft.

Referring now to FIG. **3**, there is shown the sand core **54** containing a pair of cavities **56**. A support arm **62** of a core-handling device is shown supporting a pair of lift arbors **64**, each including a cylindrical sleeve **66** identical to the sleeve **18** of the inflatable arbor **16** of the backdraft tooling **14**. The pair of lift arbors **64** are respectively located for being lowered vertically into the pair of cavities **56**. A fluid manifold **68** is fixed to the upper end of each arbor **64** and includes porting for routing fluid to and from the interior of the sleeve **66** by way of supply and return fittings **70** and **72** connected to respective ports of a control valve (not shown).

Specifically, referring now also to FIGS. **4** and **5**, it can be seen that each lift arbor **64** includes an elongate cylindrical support member **74** having a bore **76** extending axially therethrough and in alignment with a counterbore **78** formed in the top of the member **74** and into which a cylindrical projection **80**, formed on the bottom of the manifold **68** is received, the manifold containing a bore **82** coupled in fluid communication with the fittings **70** and **72** and with the bore **76** in the member **74**. Suitable o-rings are provided for preventing leakage about the projection **80**. A pair of cap screws **83** extend through a horizontal leg **84** of an L-shaped mounting bracket **85** and are threaded into threaded blind bores provided in the top of the support member **74**.

A lower end section of the support member **74** defines an upper plug **86** inserted into a top end section of the sleeve **66** by a distance equal to the length of the top plug **20** of the cylinder **16** of the backdraft tooling **14**, the plug **86** having an enlarged lower end **88** having an outer diameter equal to the inside diameter of the sleeve **66**. Closing the bottom of the sleeve **66** is a bottom plug **90**, like the bottom plug **22** of the cylinder **16**, which is inserted into a lower end section of the sleeve **66** so that a lower end of the plug **90** is flush with a lower end of the sleeve. That part of the upper plug **86** extending between its enlarged lower end **88** and the remainder of the member **74** forms an annular recess **92** located entirely within the top section of the sleeve **66** and having annular grooves **94** at locations spaced axially therealong. An upper pair of crimp rings or bands **96** encircle the upper end section of the sleeve **66** and compress it against the plug **86** and into the grooves **94**. The bottom plug **90** includes a plurality of annular grooves **98** located therein below an enlarged upper end **100** of the plug. A lower pair of crimp rings or bands **102** encircle and compress the lower end section of the sleeve **66** against the exterior of the plug **90** and into the grooves **98**.

Thus, with reference once again to FIGS. **2** and **3**, it will be appreciated that if it is desired to move the sand core **54**, it is necessary only to lower the lift arbors **64** to the respective bottoms of the cavities **56** and to then inflate the sleeves **66** so that they expand and engage the barrel-shaped sections **58** of the cavities **56**. Due to the backdraft nature of the upper halves of the sections **58**, the arbors **64** are "locked" onto the core **54** so that it may be lifted and maneuvered without coming loose from the arbors. When it is desired to remove the arbors **64** from the core **54**, it is necessary only to deflate the sleeves **66** so that they return to their normal cylindrical shape which permits their easy withdrawal from the cavities **56**.

I claim:

1. In a system for preparing a foundry sand core and for handling the sand core thus prepared, said system including tooling for forming at least one cavity in the sand core and a lifting device having at least one expandable arbor shaped for entering said cavity, when not expanded, and gripping the walls of the cavity when inflated, the improvement comprising: said tooling being shaped for forming a cavity having backdraft and said arbor being inflatable and being shaped for easily entering said cavity when deflated and for tightly engaging said cavity having backdraft when inflated while in said cavity to thereby lock the lifting device arbor to the core.

2. The system defined in claim **1** wherein said tooling for forming at least one cavity in the sand core includes an inflatable second arbor of a construction similar to said first mentioned arbor whereby said second arbor may be positioned in a corebox and inflated prior to core sand being rammed into the corebox and then deflated and removed after core sand has been rammed thereabout to thus form said cavity having backdraft.

3. The system defined in claim **2** wherein each of the arbors includes an elastomeric sleeve which is normally cylindrical and into which pressurized fluid is routed for inflating the same, the sleeve having a barrel-shaped section when inflated, whereby said one cavity includes a similar barrel-shaped section, with half this section having backdraft.

4. The system defined in claim **3** wherein each sleeve includes first and second plugs respectively inserted into first and second ends thereof; and first and second clamp means respectively encircling opposite end sections of each sleeve and holding these end sections in tight engagement with the first and second plugs.

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